

DISRUPTING the PANDEMIC INNOVATIVELY

Interview with
Dr Rena Dharmawan

Trained as a surgeon but having a passion for innovation, Dr Rena Dharmawan is an entrepreneur at heart. During the COVID-19 pandemic, she continued pursuing her innovative interests and came up with SwabBot, Southeast Asia's first patient-controlled automated machine for conducting swab tests for the diagnosis of COVID-19. We speak with Dr Dharmawan on her invention, how she got involved in technological innovation and how she juggles being a surgeon and an innovator.



Tell us a bit about yourself, and how you came to be involved with the automated swabbing machine project. What spurred you to come up with it?

I'm an associate consultant in the Department of Head & Neck Surgery, Division of Surgery & Surgical Oncology, National Cancer Centre Singapore. I also hold a position in Duke-NUS Medical School as a Clinical Entrepreneur-in-Residence in the Centre for Technology and Development and Office of Innovation & Entrepreneurship. My clinical and surgical interest is in thyroid, parathyroid and endocrine head and neck surgery. On top of surgery, my other passion is really in medical device innovation. I took a year off residency in 2014 to do a fellowship with Singapore Biodesign (SB; formerly Singapore-Stanford Biodesign). Thereafter, I co-founded and am part of the founding team of three local Singapore-based start-ups: Privi Medical ([\[privimedical.com/\]\(https://privimedical.com/\)\), Jaga-Me \(<https://www.jaga-me.com>\) and Aardvark Labs/CATALYST \(<https://www.thecatalyst.sg/>\).](https://</p>
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SwabBot is an automated nasopharyngeal (NP) swab for the diagnosis of SARS-CoV-2. The project started alongside the COVID-19 pandemic in April when we, specialists in head and neck surgery, ENT and anaesthesiology, were rostered to do all the NP and oropharyngeal swabs in SGH in the emergency department, fever screening area and inpatient wards. My colleague, head and neck surgeon Dr Tan Ngian Chye, and I felt that this could be automated and done by a robot instead of exposing a healthcare worker (HCW) to potentially COVID-19 positive patients. The end-product would be like going to the optometrist to check your eyes, where one can just fix your head in the ideal position and get the swab done. We envisioned a kind of "instant photo booth" for NP swabs, used as a screening tool for the diagnosis of SARS-CoV-2.

Thus, the aims of automating this process was to not only eliminate the need for a human or HCW to perform the procedure and reduce exposure of HCWs to potentially positive patients, but also to improve the quality of the process and to systematically perform the NP swabs.

Were there any hurdles you encountered along the way?

Yes, there were definitely a lot of hurdles when innovating and inventing a medical product. We were lucky to have met our technical/engineering and commercial partner, Biobot Surgical Pte Ltd. Their chief executive officer, Mr Sim Kok Hwee, is well known in the local medical technology (medtech) scene, and their lead engineer, Dr Hee Jiayun, was also a fellow with SB. We worked very closely to design and prototype SwabBot to ensure that it is safe, follows the anatomy of the nasal airway and nasopharyngeal space, and is also user-friendly for the patient and operator.

Other hurdles a clinician-innovator needs to deal with to ensure their product reaches the market is meeting the administrative requirements and making sure all the paperwork is done properly to get a product on the ground for clinical trials and commercialisation! These include the Institutional Review Board application, Research Collaborative Agreement, patent filing, Health Sciences Authority notification and application. It is important to ensure all the right steps are taken before commercialisation and implementation of clinical trials for the safety of our patients.

Are you currently involved in any other projects that you can share with us?

Other than SwabBot, I am involved in a few other projects in the general surgery and orthopaedic space. I am also very involved in CATALYST, a clinician-led co-working space for healthcare start-ups to build the local ecosystem, educate clinicians on innovation and encourage more collaborations between clinicians and start-ups to create products useful for our patients.

Could you share more about why you decided on taking a year off residency in 2014 for a fellowship with SB? How was the experience?

Trained as an engineer, I was always interested in using technology to improve the way we provide healthcare. I guess that was part of the reason I chose surgery, because we use a lot of these gadgets and “toys” in the operating theatre and clinics. I thought it would be cool to invent my own medical products and devices, but I was not trained and didn’t know how to. That’s why I decided to take the leap and apply for the SB fellowship to learn more about the Biodesign Innovation Process and be surrounded by fellow innovators; and also network in Silicon Valley and the local Singapore medtech ecosystem.

It was a great experience – I would even say life-changing – because it equipped me with a new way of thinking and analysing problems. It is really the Biodesign mindset that allowed me to quickly identify unmet clinical needs worth working on as I continued to be in clinical practice. It enabled me to put



Left to right: Clinical Associate Prof Tan Ngian Chye, Dr Rena Dharmawan, Dr Siti Radhiziah Binte Sudirman, Dr Tay Hsien Ts’ung, Ms Hee Jia Yun, Mr Kee Yew Hwee, Mr Sim Kok Hwee

Seated: Dr Paul Tern

together a good team of individuals with multidisciplinary backgrounds to come up with a useful solution to solve that need, and implement that solution with the aim of commercialisation of the product. On top of that, it also opened doors to a lot of different mentors in the medtech ecosystem who not only inspired and advised me, but were also crucial in making connections to get things done.

You mentioned co-founding several start-ups on top of your work as a surgeon. Were there any particularly memorable instances where you had to choose between your work in the start-ups and as a surgeon?

As a clinician/surgeon-innovator, I believe strongly in staying in clinical practice to remain current. This way, I can have the most up-to-date knowledge of my subspecialty, constant access to unmet clinical needs to innovate in and eventually the opportunity to design and implement clinical trials for medical products/devices.

Although it is difficult to juggle training and medtech responsibilities, because both aspects definitely need dedicated time to ensure they both flourish and succeed, there were no particularly challenging instances. I always wished we had more time, but I believe it is possible with good time management. I am grateful to have very supportive bosses, colleagues and departments that allowed me to pursue both my passion in surgery and medtech innovation.

With the disruptions COVID-19 has caused in everyone’s lives, do you see the opportunity for innovation to emerge?

COVID-19 provides huge opportunities for innovation! Be it in the biotechnology scene with the development of diagnostic kits and tests to developing therapeutics and vaccines, in medtech with the use of robotics or medical devices to ensure proper infection control and personal protection, or in health technology (healthtech) with the importance of improving access and infrastructure for telemedicine.

What kind of innovations have you seen during the pandemic? Were there any in particular that caught your attention?

I think one of the main “healthcare innovations” that is flourishing during these times is telemedicine and home care, and using technology to bring better healthcare to patients virtually and in the comfort of their homes.

Do you have any advice for colleagues who may also be looking into developing medtech or other innovations related to healthcare?

I know it’s cliché but I still believe in “following your passion” and creating your own path. As Steve Jobs said: “Your time is limited, so don’t waste it living someone else’s life.” Find a good mentor both in your clinical practice and also in medtech/healthtech innovation. That one person can make a huge difference in your life and direct you in the right way. ◆